

Statistical information on Technical Innovation in Brazil

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Science and technology, innovation and economic modernization in Brazil.

Brazil is going through a very significant process of economic modernization, which begun with the opening of the country's economy to the international markets in early 1990's, and intensified with the stabilization program of 1994. Faced with increasing international competition and a stable environment, firms operating in Brazil faced the need to reduce costs, increase efficiency and improve the quality of their products. This change in the environment coincided with the increasing role of knowledge-intensive technologies, products and management in all spheres of economic activity. The impressive gains in productivity of Brazilian firms in recent years were obtained by short-terms strategies such as organizational streamlining, the introduction of new equipment, mergers, acquisitions and restructuration¹, rather than through long-term investment in Research and Development and manpower training and education. However, as the effects of these short-term adjustments wear out, and the need for increasing efficiency remains, skills and innovation are likely to play an increasing role in Brazil's economic growth. It is important to know to which extent this process is already taking place or is expected to occur; how different firms are going about it; the resources they use for this purpose; whether they make use of the supply of scientific and technological potential which already exists in the country; how they tap the international flux and markets of free and proprietary knowledge and technology; the role of tax and credit incentives for innovation and R&D; and so forth.

Most Research and Development activities in Brazil so far have been public. The usual estimate is that about 80% of the resources for R&D in Brazil are provided and spent by the public sector, but information about the other 20% is scant, and used to be attributed in large part

¹See Antônio Barros de Castro, "O Plano Real e o Reposicionamento das Empresas", paper prepared for the IX Forum Nacional, Rio de Janeiro, 1997.

to state-owned corporations (Petrobrás, Telebrás, Eletrobrás, etc.), most of which are now being privatized. This situation is clearly inadequate, and the government's intention is to increase the weight of the productive and private sector's participation in the R&D effort. PADCT III is supposed to help this effort at redirection, by strengthening Brazil's R&D capabilities and linking it more directly to the productive sector.

Also inadequate is the traditional emphasis placed in Brazil on the higher end of the broad spectrum of science and technology activities, characterized by complex technologies and basic research, to the detriment of activities such as piece-meal innovation and adaptation. Countries where science and technology are actively used for the common good cover the whole spectrum, or give more weight to innovation, which takes place within the productive sector, than to basic research and complex technological development, typical of academic institutions, specialized institutes and high technology industries.

Information about science, research and development in Brazil.

The peculiar ways in which Brazil's science and technology sector developed in the last several decades explain the kind of information which is available, and what is lacking. The Ministry of Science and Technology, the National Council for Scientific and Technological Development (CNPq) and the Ministry of Education provide a wealth of information on graduate programs, number of research projects, number of researchers, and budgets and expenditures on graduate education, fellowships and research - in other words, the on the supply of R&D capabilities at the higher end. Brazil lacks, however, information about what is actually taking place on the demand side of R&D, which should include the private sector as well as parts of the public sector which are potential or actual users of science and technology inputs - agencies dealing with environment, energy, urban planning, poverty and education, to list a few. It is appropriate to refer to this demand by the term "technical innovation", or innovation as such, expressing the fact that these activities consist often on marginal improvements and adaptations of existing technologies, more than R&D in the usual sense. The little we know about the productive sector is provided by the periodical surveys of ANPEI, a voluntary association of private firms, about the research activities of its members, or eventual surveys such as the one carried on some time ago by the Project on Industrial Competitiveness at the Universidade de Campinas, supported by PADCT II. An ambitious survey on Industrial restructuring in São Paulo carried on by Fundação SEADE in the second semester of 1997 is supposed to provide new insights on the weight, relevance and characteristics of innovation in this important segment of the Brazilian economy.

The potencial contribution of Brazil's Institute for Geography and Statistics - IBGE.

IBGE is Brazil's central statistical office, responsible for activities which, in the United States, are covered by different agencies, such as national accounts, demography, cost of living indexes, agricultural production, household surveys, employment statistics, cartography and others. By law, IBGE is responsible for the coordination of Brazil's statistical activities in all areas. In practice, specialized institutions can generate their own data, often in cooperation and in agreement with IBGE.

The contribution IBGE can provide to the development of information on innovation in the productive sector stems from its broader work on economic statistics. IBGE is revising its whole approach to economic statistics, and it is clear that the innovation component, which so far has not been in the Institute's agenda, should become a major concern of this revision.

Very briefly, IBGE's traditional approach to economic statistics was to carry out a national, comprehensive economic census every five years, yearly surveys of the industrial sector, and a series of continuous measurements of industrial and agricultural production, employment and prices; all this information is consolidated in a system of national accounts. Data on physical production in the industrial and agricultural sectors are central in this approach, which was conceived in the sixties and seventies. There are two sets of known shortcomings in this approach, which IBGE is working to overcome. The first is mostly practical. Economic censuses are extremely expensive, requiring special budgetary allocations, and 1985 was the last year when they were done. Besides cost, the analysis of such a complex set of data proved much more difficult than it was expected, and several years passed before the 1985 data became available as the basis for the yearly surveys and continuous follow-up operations. Peculiar decisions on classification of activities and definitions of firms made international comparability difficult. Starting in 1995, IBGE decided to follow the experience of other countries and replace the traditional census by the establishment of a permanent registry of economic units, based on a "registry census" covering about 600 thousand units (from a universe of about 4 million) and adopting a newly introduced, UN supported, internationally comparable classification of economic activities. The survey gathered information on all firms above 20 or 30 employees and a sample of the remaining ones, collecting information on the number of employees, salaries paid, and gross earnings. This registry is being permanently updated with information taken from administrative registries from the Ministries of Labor and Economics and IBGE itself, and, starting in 1997/8, it will provide the statistical framework for the yearly surveys and the continuous studies on economic trends. For the agricultural sector, IBGE maintained the traditional census, which was done in 1996, under the assumption that this sector was not

sufficiently formalized to be covered by a similar registry. The next step in this new approach is to devise the new contents of the yearly industrial survey, and a strategy to study, through periodical satellite surveys, different aspects of the economic activity not covered by the yearly survey.

The other shortcoming in the traditional approach is more conceptual: the understanding, when it was conceived, was that industry was the driving force in economic development, and that industrial, as well as agricultural production, should be best measured in terms of physical production. This approach, based on the international practices of the time, did not allow for the understanding of what is now known as the "invisible sector", and did not pay enough attention to the services. Today we know that the physical production is a limited indicator of economic production, that services and "invisible" products pay an increasingly important part in the economy, and that the informal sector is also of growing importance, not only in terms of marginal activities, but also through a very complex set of family-based enterprises. A comprehensive and updated view of the Brazilian economy requires very complex changes in the production of its basic statistics, which should include more and better information on the informal sector, on the production of "invisible" goods and services, on international transactions, on the environmental costs of economic production, and on the quality of life and consumption patterns of the population. IBGE is working on most of these questions, according to its limited capabilities of resources and manpower. An experimental survey on the informal sector in Rio de Janeiro was carried on in 1994 based on household interviews, with a national survey being done in 1997; a monthly survey on commercial activities started also in Rio in 1995, and will be extended to other states. Other projects are being envisaged for the services sector. The study of technological innovation should be part of this new picture.

If it is true that technological innovation is a central, and potentially the most important driving force in economic development today, the measurement and assessment of the innovative capabilities, potential and effective action of firms should be included at the very core of IBGE's basic statistical information. The growing literature on the subject, and the experience of countries which have already moved in that direction, confirm that it is not enough to measure the supply of R&D components, nor the availability of manpower in general terms. We know enough, at this point, about the possibility of wasting efforts and money in building R&D capabilities that never produces significant social or economic gains. It is necessary to see what happens in each firm and economic sector, not only on their inputs (like, for instance, the number of scientists and engineers, the number of available personal computers, money spent on in-house training and education) but, more directly, to evaluate how firms get new information (in-house, from universities, buying from other firms), where they are used most (in management, new and

improved products, new and improved processes), the extend of actual and expected innovation (from simple improvements to innovative products), how they deal with questions of intellectual property, and so on. Adequate information on availability and use of innovation would allow us to understand the strategies firms use to restructure and meet the new challenges of competitiveness, and guide public policy to support these strategies.

IBGE has been working so far with the Ministry of Science and Technology on a project to add some questions related to innovation in the yearly industrial surveys, and to develop a satellite questionnaire in 1998, to be repeated once every four or five years. This strategy would not cover the service, agricultural and the public sector, which would be included at a later stage, and its main usefulness would be to provide some benchmarks for localized surveys to be done by private, academic or regional agencies.

IBGE's PADCT proposal

This proposal is to amplify the scope and broaden the content of this joint project. Given the growing importance of the services sector and modern agriculture in the modernization of Brazilian economy, it is necessary to know what it is happening in those sectors at once, in spite of the obvious complexity and lack of experience, which is widespread, in studying the services sector. IBGE, in cooperation with the Ministry of Science and Technology and specialists from other institutions, should make an evaluation of the existing experience of innovation studies in Brazil, as well as of the international experience which already exists in institutions such as OECD, and work toward the development of a relatively small questionnaire which and an appropriate sampling framework which could be researched by IBGE on a steady basis, allowing for other institutions to develop in-depth studies of geographic areas, branches of activities and specialized technologies. The expectation is that, in a year, it would be possible to make this assessment of the national and international experiences, to define a sampling framework and to carry on a pilot study. A full study could be carried on in the following year, accompanied by intensive work of analysis and interpretation of the results. From then on, IBGE should incorporate a periodical survey on technological innovation as permanent component of Brazil's statistical system.